

【台電彰化離岸海氣象觀測塔】

海氣象觀測塔設置的目的，用於前期蒐集具風場開發潛能場址的海氣象資料，提供精確風能評估及工程設計參考外，亦可作為風機最適基礎形式的現場驗證，以及提供後續營運階段的風場操作與風能覆核使用。







有關量測儀器的設置則須考慮固定架安裝，且設置須符合 IEC 61400-12-1 規範之規定，規範風速由杯式風速計量測(Cup Anemometer)，風向由風向計(Wind Vane)量測，杯式風速計與風向計量測頻率均為 1Hz。



圖：離岸風場之海氣象觀測塔

在觀測塔上有四個不同高度的風速、風向量測點高程分別是 10、30、50、95 公尺，以推算邊界層以及風速剖面分佈。由於邊界層是在海、氣交界面形成，邊界層特性受熱通量(Heat Flux)與質量通量(Mass flux)影響，需要至少兩處高程量測溫度、濕度與壓力等參數。另外，亦需量測降雨量，以評估其對風場的影響。觀測塔上的氣象量測儀器如右表。在海象的觀測上，海流、波浪的量測採浮球式波浪儀，水位的量測採設置超音波潮位計，可提供量測波浪（波高、週期）、海流、潮位高度，鹽溫深儀可量測鹽度、海水密度及海水溫度等水文資料。持續蒐集海氣象觀測資料，並進行維運工作及系統維護，提升海象資料蒐集方法。

將波浪海流監測儀警示陣列浮標技術技轉給國內從事海象資料觀測廠商，以提升我國產業於海事專業，取得離岸測風塔雙重觀測系統專利、離岸觀測塔風向定向系統專利，並進行風能即時預測，可預測 1hr 後之風速風向反應達 90%，預測出正確的時間進行預測性維運，減少成本的浪費及損傷，甚至優化維運例程、加強工作場所安全性、提升風機測風品質，進而達成能源政策目標與建立健全本土化離岸風電產業鏈。

儀器項目	風速計	風向計	大氣壓力計	溫溼度計	雨量計	日輻射儀
						
量測項目	風速	風向	大氣壓力	溫度、濕度	雨量	淨輻射
儀器項目	潮位計	鹽溫深儀	海流儀	無線微波器	太陽能板	蓄電池
						
量測項目	水位	鹽度、溫度、深度	波高、波週期、流向	無線電波傳輸	電源供應系統	





【Chanbin Offshore Met Mast】

The early offshore wind assessment for potential site investigation needs to set up the marine meteorological mast at specific location. Hence, precise wind assessment and engineering consideration could be the crucial verification for the optimal wind turbine design model and related operation and maintenance of wind farms.

The necessary brackets for sensor installation should be well considered based on criteria of IEC 61400-12-1. The frequency of wind speed and wind direction are defined as 1 Hz and need to be measured by anemometer and wind vane per second correspondingly.

There are four levels: 10m, 30m, 50m and 95m designed to collect wind data to profile the wind flow boundary layer vertical distribution. The boundary layer is the interface between air and sea water and affected by heat flux and mass flux so two levels are more suitable to collect sufficient parameters such as temperature, humidity and pressure at least. Besides the inference between water drop and wind farm needs to be evaluated additionally. The summary of sensors installed at marine meteorological mast is listed as below.

For further marine measurement, buoy is utilized for ocean current and sea wave items. Ocean level is measured by ultra sonic level sensor and wave height, wave period, ocean current, ocean level, salinity, ocean temperature and seawater density are all defined to be measured as well. The consistency and stability of these measured data can be enhanced by well operation and maintenance to improve marine information quality.

儀器 項目	風速計	風向計	大氣壓力計	溫溼度計	雨量計	日輻射儀
						
量測項目	風速	風向	大氣壓力	溫度、濕度	雨量	淨輻射
儀器 項目	潮位計	鹽溫深儀	海流儀	無線微波器	太陽能板	蓄電池
						
量測項目	水位	鹽度、溫度、深度	波高、波週期、流向	無線電波傳輸	電源供應系統	

Buoy protection system is developed based on severe offshore environment and transferred to the domestic cooperative company sequentially. To improve Taiwan offshore marine engineering and operation is cultivated by new techniques such as “Offshore optical measuring system by meteorological mast” and “Offshore orientation technique for wind vanes in met mast” Technique of wind data prediction ahead of more than an hour has achieved 90% accuracy. It benefits for wind power management and maintenance cost. Consequently energy policy and localization of wind power industry will be demonstrated gradually.